

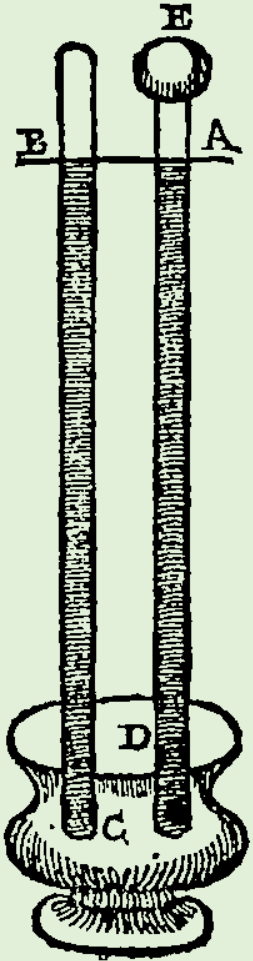
Europe's oldest instrumental meteorological observations

Dr Stephen Burt

Irish Meteorological Society

Foxford, Co Mayo - 20 May 2023

Invention



- Barometer
 - Evangelista Torricelli
1644



- Thermometer
 - Galileo
thermoscope
c.**1599**
 - Sealed
thermometer:
Ferdinand II,
Grand Duke of
Tuscany, c.**1641**



Invention

- 1678: Automatic weather station (Wren and Hooke)

Mr Hook[e] produced a part of his new weather Clock which he had been preparing which was to keep an Account of all the Changes of weather which should happen, namely the Quarters and points in which the wind should blow 2ly the strength of the Wind in that Quarter. 3ly The heat and cold of the Air. 4ly The Gravity and Levity of the Air. 5ly the Dryness and moisture of the Air. 6ly The Quantity of Rain that should fall. 7ly The Quantity of Snow or Hail that shall fall in the winter. 8ly the times of the shining of the Sun. This he was desired to proceed with all to finish he hoped to doe within a month or six weeks.

From Royal Society Journal Book (JBO/6), dated 5 December 1678

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Earliest surviving records

- Italy: Medici network, based in Florence **1654-70**
- Italy: Pisa, daily barometer series **1657-58**
- England: Oxford, thermometer **1666** (John Locke)
→ *Manley's CET 1659-*
- England: London, barometer and thermometer **1672-**
(Robert Hooke)
- Near-complete daily pressure series Paris since **1670**,
London **1692 to date**

The first meteorological networks

Camuffo and Bertolin, *Climatic Change* 2012

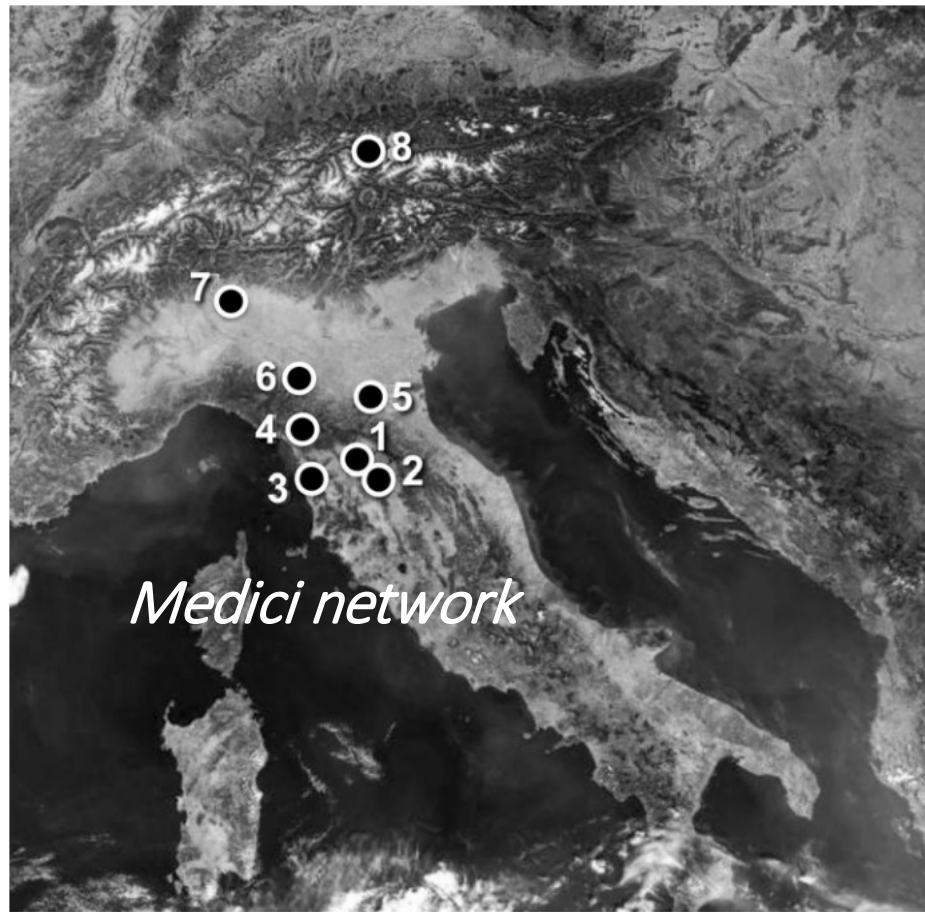
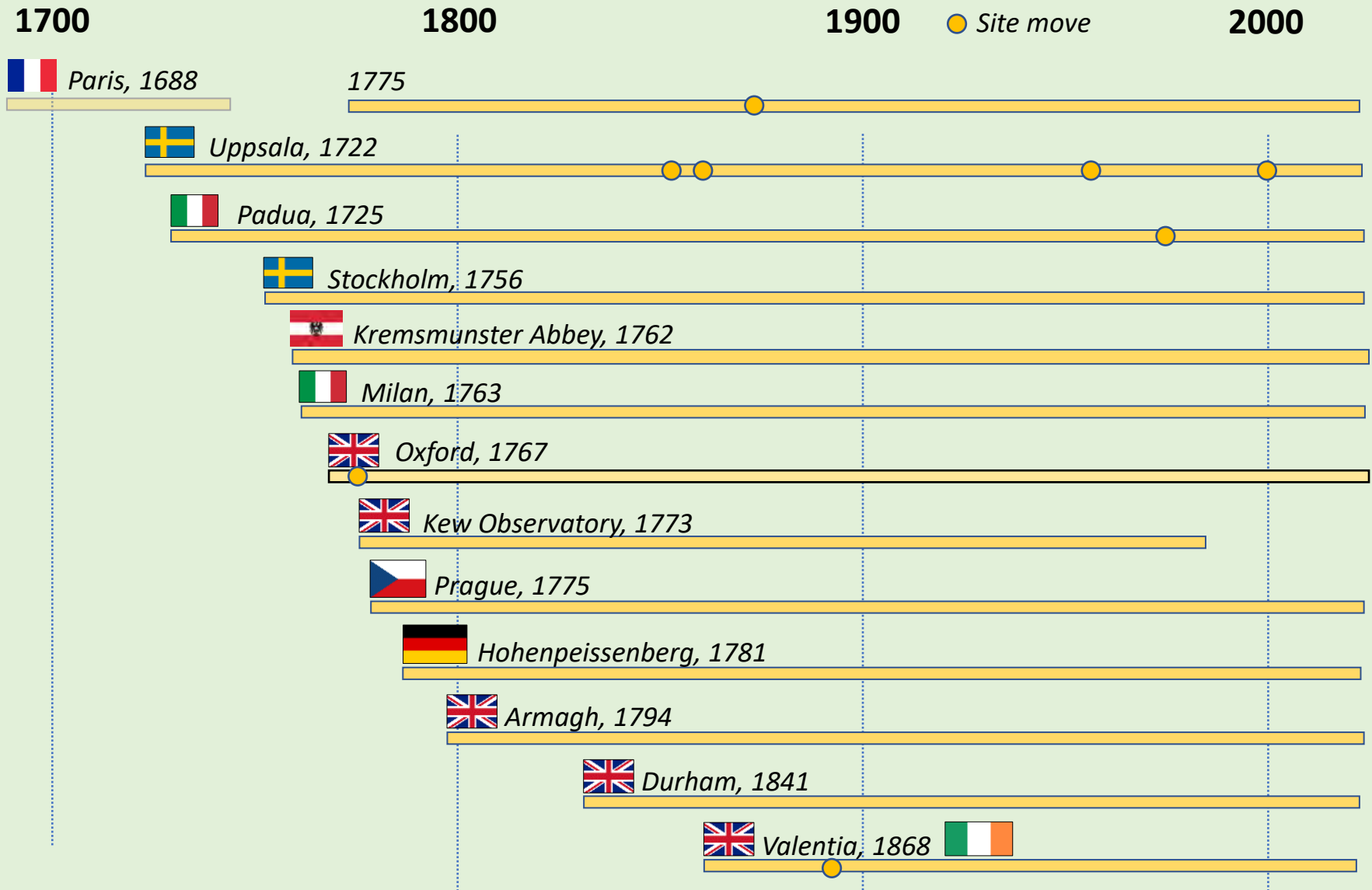


Fig. 1 Map of the seven Italian stations of the Medici Network formally active for the 1654–1667 period and in practice from 1654 to 1670, i.e. 1-Florence, 2-Vallombrosa, 3-Pisa, 4-Cutigliano, 5-Bologna, 6-Parma and 7-Milan (station 8 is outside Italy)

- Medici network **1654-1670**
 - Ferdinand II, Grand Duke of Tuscany
 - 11 stations, identical thermometry
- Societas Meteorologica Palatina **1781-1792**
 - Karl Theodor, Elector of the Palatinate
 - 39 stations - eastern America to Ural Mountains, Greenland to the Mediterranean
 - Established standardized instruments, observing procedures and observation times

Europe's longest weather records





Anders Celsius 1701-1744



Courtesy University of Uppsala

- First Nordic temperature and pressure measurements 1722
- Professor of Astronomy, Uppsala University 1730-
- Pioneer in geophysics
 - Shape of the Earth
 - Arctic expedition 1736-37
 - Latitude determination
 - Longitude determination
 - Gravity measurements
 - Sea level change
 - Magnetic fields and aurora borealis
- Inventor of Celsius temperature scale 1743



Original Delisle scale



Handwritten Celsius scale



°C

70 30

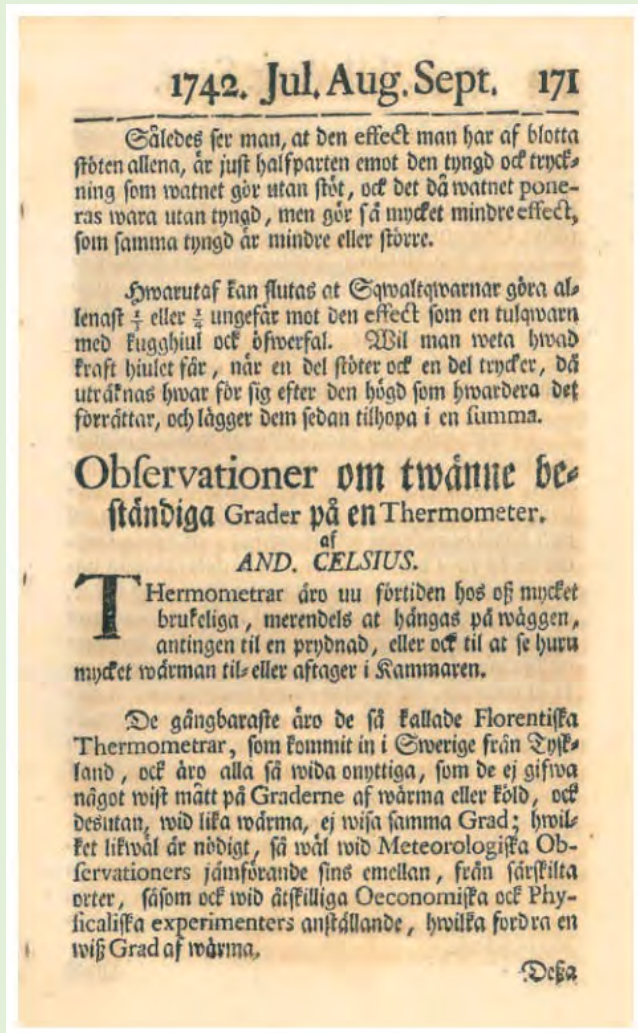
80 20

90 10

100 0

110 -10

The Celsius temperature scale



- First used in barometer temperature observations, December 1741
- Experimentally defined by two fixed points
 - Melting point of ice, at 100 degrees
 - Boiling point of water, at 0 degrees
 - 'Centi-grade' scale
- Published 1742
 - Celsius, A (1742): Observationer om twänne beständiga grader på en thermometer. *Kongl. Svenska Wetenskaps Academiens Handlingar*, 3, 171-180
- Scale later reversed by Daniel Ekström c. 1744

1743. Jun.	Baro- metr.	Thermometra				Cels:	Ventus: plag: & gr:	Om- brom.
		Hauksb.	de Vill.	Prinjian: majus,	minus.			
2. 3 $\frac{1}{4}$ p.	29.81.	29, 8.	122, 6.	68, 5.	68, 5.	80, 7.	WSW. 3.	-
10. p.	81.	32, 1.	125, 5.	65, 4.	65, 2.	83, 4.	SW. 1 $\frac{1}{2}$	-
3. 5 $\frac{1}{4}$ a.	82 $\frac{1}{2}$	40, 0.	129, 2.	60, 3.	60, 5.	85, 3.	SW. 1.	-
10. a.	87 $\frac{1}{2}$	36, 5.	126, 6.	64, 0.	64, 0.	83, 4.	WSW. 2.	-
3 $\frac{1}{2}$ p.	90.	28, 9.	121, 5.	70, 0.	70, 0.	79, 8.	W. 2.	-
10 $\frac{1}{4}$ p.	95-	28, 3.	123, 2.	68, 0.	68, 0.	81, 6.	W. 1 $\frac{1}{2}$	-
4. 5. a.	98.	40, 1.	129, 2.	66, $\frac{1}{4}$.	66, $\frac{2}{4}$.	85, 2.	W. 0 $\frac{1}{2}$	-
3 $\frac{1}{2}$ p.	30, 02.	20, 0.	116, 0.	76 $\frac{1}{2}$	76 $\frac{1}{2}$	76, 0.	N. 1 $\frac{1}{2}$	fl: S
10 $\frac{1}{4}$ p.	07.	25, 6.	121, 6.	70 +	70 $\frac{1}{4}$.	80, 8.	-	0.
5. 4 $\frac{1}{4}$ a.	09-	39, 0.	129, 7.	66 $\frac{1}{2}$.	66 $\frac{1}{2}$	86, 0.	-	0.
10. a.	09.	27, 8.	120, 8.	70 $\frac{3}{4}$.	70 $\frac{1}{2}$.	79, 8.	S. 1.	-
4 $\frac{1}{4}$ p.	03.	15, 0.	113, 5.	80.	79 $\frac{1}{2}$.	74, 5.	SSW. 1 $\frac{1}{2}$	-
10 $\frac{1}{2}$ p.	29.97.	24, 5.	131, 2.	70 $\frac{1}{2}$	70 $\frac{1}{2}$.	80, 5.	SW. 1 $\frac{1}{2}$	-
6. 4 $\frac{1}{4}$ a.	87.	32, 0.	125, 0.	66 $\frac{1}{2}$	66 $\frac{1}{4}$.	82, 7.	SSW. 1 $\frac{1}{2}$	-

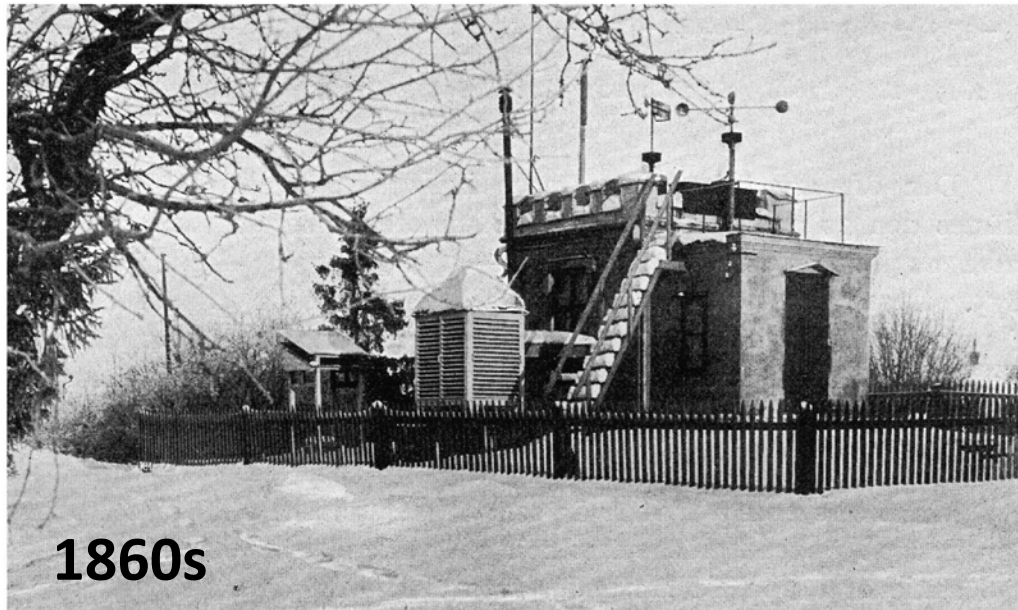
First 'Celsius' logbook entries in Uppsala record
2 June 1743



Courtesy University of Uppsala

Uppsala

Courtesy University of Uppsala



1860s



2022

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Padua, Italy *1725 to date*



Dario Camuffo

Stockholm, Sweden *1756 to date*



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Kremsmünster Abbey, Austria

1762 to date

The Radcliffe Observatory, Oxford

1767 to date



*The Observatory from the south-east, about 1814, from R. Ackermann,
A History of the University of Oxford, 1814 (Green College, Oxford)*

Thomas Hornsby

1733-1810

Green Templeton College, Oxford



	8.15 a.m.	29.49	34.1			Fair & clear	21.7
30	3.15 p.m.	29.55	40.1	N.W.	1	Overcast Rain	5.2
	4.50 p.m.	29.56	39.0			overcast Rain	0 42.4
	11.50 p.m.	29.67	36.2			Foggy	
31	10.45 a.m.	29.75	38.1	S.	1	Overcast	at 8.1/2
	5.30 p.m.	29.67	41.3			Overcast small rain	0.16.3
	10.25 p.m.	29.70	41.2			Overcast small rain (H.W.)	2 1
February 1760 Feb. 11 th 24 th							
	8.55 a.m.	29.66	43.7	S.	1	Overcast	
1	6.10 p.m.	29.47	45.1			overcast shows haze at 4.00	
	10.40 p.m.	29.59	42.0			Overcast Rain still	
2	7.30 a.m.	29.89	37.2	N.	1	Fair & clear	
	11.55 p.m.	30.11	35.2			D Light	
	9.30 a.m.	30.16	36.0	N by E.	1	Fair	
3	3.45 p.m.	30.17	41.1			Fair	
	6.30 p.m.	30.19	38.0			Starlight	
	8.45 p.m.	30.21	35.1			Somewhat Foggy	
	10.0 p.m.	30.21	34.3			Starlight.	
4	5.50 a.m.	30.17	30.0	S.	1	D Light hazy	at 4.1/2
	10.15 p.m.	30.4	39.3			Fog.	0 27.2
	6.0 a.m.	29.83	30.0			Foggy	
5	0.35 p.m.	29.64	35.3	S.	1	Overcast	
	4.0 p.m.	29.53	37.1	S.	1	Overcast	
	10.20 p.m.	29.45	35.2			Overcast Rain	
6	6.0 a.m.	29.50	35.0			Hazy	
	11.10 a.m.	29.60	36.2	N.	1	Overcast	
	10.20 p.m.	29.64	33.1			Overcast	
	7.50 a.m.	29.59	33.3			Fair	
7	11.45 a.m.	29.62	38.2	W.	1	Fair small 2 nd of snow & g.	
	3.0 p.m.	29.63	41.0	W.	1	Fair	
	10.15 p.m.	29.81	33.1			Starlight	
	6.0 a.m.	29.86	30.0			Fair but rather Hazy	
8	0.30 p.m.	29.86	39.0			Cloudy	
	10.5 p.m.	29.81	39.0			Overcast	
	5.55 a.m.	29.72	39.1	S. by W.	1/2	Overcast	
9	11.0 a.m.	29.67	43.2	S by W.	2	Cloudy	
	9.0 p.m.	29.64	45.0			Overcast shows 2 nd of snow	
	10.30 p.m.	29.65	44.3			Overcast Rain	

The Radcliffe Observatory, Oxford



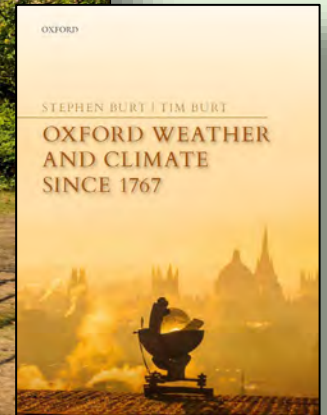
The Observatory today

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The Radcliffe Meteorological Station



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Prague, Czechia *1775 to date*

Czech Hydrometeorological Institute





Czech Hydrometeorological Institute



Prague, Czechia
1775 to date



Hohenpeissenberg, Germany *1781 to date*



Stefan Gilge, DWD



Hohenpeissenberg, Germany *1781 to date*



Stefan Gilge, DWD



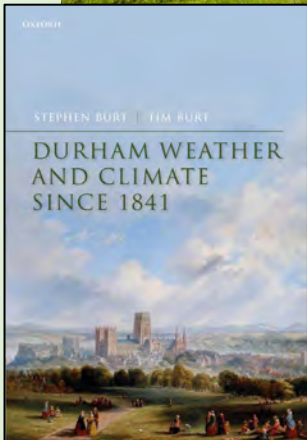
Armagh Observatory *1794 to date*





Durham Observatory *1841 to date*

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Valentia Observatory *1868 to date*



Valentia Observatory *1868 to date*



Valentia Observatory *1868 to date*





Thank you